

tance from the tangent or perpendicular than by the ordinary single arc method.

2. "The product of the minor radius and the complement is always equal to the product of the abscissa and ordinate; i.e., $rs = xy$."

Instead of *always*, this is only the case with arches of one particular proportion, which happens to be that of Mr. Laker's diagram, or nearly so.

This correction does not affect the other theorems; but can Mr. Laker verify the proposition that the curves are compound by measurements of arches so constructed? or is not the appearance an optical deception, arising from the position of the eye, or from the pier or howell caps being under the springing line, as is sometimes the case, or from the deep series of concentric mouldings on different planes? W. R. CORSON.

Leeds.

SIR.—Is not Mr. Laker incorrect in that portion of his inference which deduces

$r = \sqrt{x^2 + y^2}$ from r as a mean proportional between the height y and the chord?

Or does he mean that the height y is a mean proportional between the minor radius and the chord which would lead to the equation he has obtained?

As the equation stands now it vitiates his definition. MATHEMATICIAN.

London.

Having submitted the above to Mr. Laker he replies as follows:

"I am greatly obliged by the courteous and friendly strictures of your correspondents.

"Mathematician" has pointed out an extraordinary misplacement of terms in my second theorem, namely, that "the minor radius is a mean proportional," &c.; whereas the reading should be:—

"Theorem 2.—The minor radius projects the lower portion of the curve. The height, or rectangular ordinate y , is always a mean proportional between the minor radius and the chord joining the apex and base. The value of this chord, calling the half width or abscissa, x , is by the well-known property of the right-angled triangle, $\sqrt{x^2 + y^2}$. (Eucl. i. 47.)

Hence, $r = \frac{y^2}{\sqrt{x^2 + y^2}}$.

I beg pardon for this oversight, but that it was merely accidental, is manifest from the fact, that my whole argument is built on the correct assumption.

I must, however, contend for the universal truth of the equation, $rs = xy$. Mr. Corson's diagrams* exhibit the general application of my theory to all pointed arches. They also shew its superiority for ensuring point under all circumstances. This would be very evident in an arch whose height should equal the half-width.

In the diagrams, your correspondent has understood $x + y = r + s$; but this is a misapprehension.

It may be proved that $r = \frac{y^2}{\sqrt{x^2 + y^2}}$ and

that $s = \frac{x^2}{y\sqrt{x^2 + y^2}}$. Let these two values of r and s be multiplied into one another, and the product will be xy , as was proved geometrically.

As I do not contend about words, I confess that the remark about "perpendicularity" should have been qualified. The idea in my mind was, that with the same base I obtain greater aspiration: a circumstance very accordant with the genius of the pointed style. My object has been to prove that pointed arches of all proportions may be (and probably were) struck by one uniform equation. If I have succeeded, let me humbly hope that I have done the style some service, and that Tudors need not be left to the "rule of thumb."

THOMAS LAKER.

Waverley, Liverpool.

LECTURES AT THE SOCIETY OF BRITISH ARTISTS.—Mr. Hurlstone, the president, closed the school season on the 4th inst., with an able lecture on Spanish art.

* For which we have not space.

DWELLINGS FOR THE WORKING CLASSES.

THE EXTERNAL GALLERY SYSTEM.

SIR.—The construction of appropriate dwellings for the working classes has of late attracted much of the public attention, which it highly deserves, both in a moral and in a sanitary point of view. You will, therefore, I trust, excuse my offering to your notice a few remarks on the advantages, which, in the construction of a lodging establishment on a large scale, might be derived from the adoption of a system of external galleries, or balconies, constructed along the front of each story throughout the whole extent of the building, and connected with each other, and with the ground, by staircases at distant intervals. This peculiar mode of forming a communication between the various parts of a building is frequently practised in Italy, especially in the court-yards of large inns; and one form of it is exhibited in plate 9th of the work lately published at Brussels, under the title of "Projet d'association financière pour l'amélioration des habitations, &c." Par F. Ducpetiaux.*

In framing the following considerations, I have assumed the galleries to be constructed in the most economical manner, consistent with perfect safety; to be supported one over the other by wooden or iron pillars, about 12 feet apart; to be 4 feet wide, guarded by a light iron balustrade or railing, and paved with tiles, or slate, or any other appropriate material. I do not, however, wish to lay any stress on either of these particulars, my intention being to shew the practicability and usefulness of the system, in a general point of view, leaving its details to professional men.†

1. I consider one of the chief advantages of the proposed plan to be this, that the occupants of the higher stories would possess almost the same facilities for neighbourly intercourse with all those residing on the same flat, as if they lived on the ground-floor; and the look-out from the windows, enlivened by frequent passers by, would present nearly the same degree of cheerfulness; whilst at the same time any intrusive prying in at the windows, could, besides the usual impediment of muslin blinds, be prevented by raising the level of each flat, two steps above that of its external gallery.

2. The several galleries would afford covered walks for bad weather, and an agreeable lounge, where the tired workman could sit and smoke his pipe on a summer evening, his wife usefully engaged at his side, and his children cheerfully playing about him. These galleries could, moreover, be agreeably enlivened during the fine season by flowers, reared in pots or oblong boxes, and especially by climbings, trained along the balustrade and up the columns.

3. The galleries being connected with the ground by staircases at both extremities of the building, would afford a more effectual security against danger from fire than the expensive stone staircases which have been had recourse to.

4. Peculiar facilities would be afforded, in a variety of ways, for drying the linen of the inmates, without the necessity of travelling up and down stairs, as is usually the case in buildings of many stories. I have seen practised in Italy a method of hanging the linen on an endless line passed round pulleys, which are placed opposite each other, on the two sides of a street or court-yard. The plan was evidently so successful, that I should feel disposed to give some account of it, but that it may very possibly be already known in England, though I have not had occasion to witness it. This contrivance might be very well managed from window to window, across an ordinary street, by agreement between the parties concerned; though, of course, I should not think of recommending it, save in unfrequented localities and blind alleys. But its adoption would be much more convenient and

unobjectionable where there were two series of external galleries facing each other.

5. In buildings possessing no horizontal access from one part to another, and separated, as it were, into a series of distinct houses, with only two families on each flat, the inmates are generally deprived of the convenience of having little articles of household consumption brought to their doors, either by the shop boys, or by itinerant vendors; whereas, with the system of external galleries, these persons would ply from door to door throughout the whole extent of a second, or fifth story, with much the same amount of time and trouble as if their customers were all inhabitants of the ground-floor. I may add, that many of the inmates, whose age or infirmities incapacitated them for active occupations, might apply themselves to shopkeeping in the small way, with as fair a prospect of attracting the custom of their neighbours, or neighbours' children, of the same floor, as if all were tenants of a row of cottages.

Circumstances of the nature of those referred to in the foregoing paragraphs may seem trifling in themselves, but they would contribute very much, in the aggregate, to give to apartments in an extensive and city-built lodging establishment, a character of cheerful and sociable homeliness, which buildings of that description are generally very far from possessing.

With regard to the expense of the proposed plan, as compared with the usual mode of building, I am not prepared to give any estimate; but it must be borne in mind that the whole, or the greater part of the space usually occupied by flights of stairs, in the body of the building, which are very expensive when required to be fire-proof, would become productive, by being available for additional apartments; nor can it be alleged that the galleries would be an encroachment on the public way, as they would only occupy the width of the foot pavement, which would thus gain a desirable protection.

I had intended noticing a few other points, such as, for instance, the facilities which would be afforded by the gallery system, for the introduction of economical arrangements with regard to fuel, water, and gas; but I find that these subjects would involve a discussion of pros and cons, relative to the expediency of applying to the occupations and wants of the working classes, those principles of association, and clubship, which have hitherto been chiefly confined to the pursuits and enjoyments of the rich. This is a subject open to controversy, and on which men are seen to disagree whom one would suppose equally possessed of the best information and soundest views; whilst on those points on which their opinions coincide, deeply rooted popular prejudices too frequently present an almost insurmountable obstacle to the adoption of the measures they recommend, even though experimental proof in this country or abroad may have demonstrated their practicability.

A discussion of such a nature would swell this letter to unreasonable limits. I may, however, be allowed to state my conviction that suitable and well-contrived economical arrangements, such as could easily be combined in the construction of a large metropolitan lodging establishment, and especially in one built with external galleries, might afford the means of effecting a saving of at least 20 per cent. in the usual outlay of the workman for his daily sustenance; and that this desirable result need not be confined to men or females living singly, but might be obtained in establishments for families, not only without any proportionate diminution of comfort, and without any infringement on decorum, but with a furtherance of humanizing influences, and of opportunities for intellectual development.

There is another measure by which I believe that a very material benefit might be conferred on the industrious artisan, viz. the formation of regular ateliers, or work-rooms, fitted up with the requisite conveniences for such of the manual trades as are susceptible of being carried on in company. This is the case with most of those handicrafts which are usually practised by females; and I consider, indeed, a commodious work-room for needle-women,

* This very useful work, which reflects credit on the sagacity and perseverance of the author, may be procured in London.

† The use of external galleries we should mention is not unknown in England, and has been alluded to before now in THE BUILDER. In Liverpool there is a pile of dwellings, known as Kent-terrace, if we remember rightly, so constructed.—Ed.

* See the number of the "Labourer's Friend" for October 1847, page 181.